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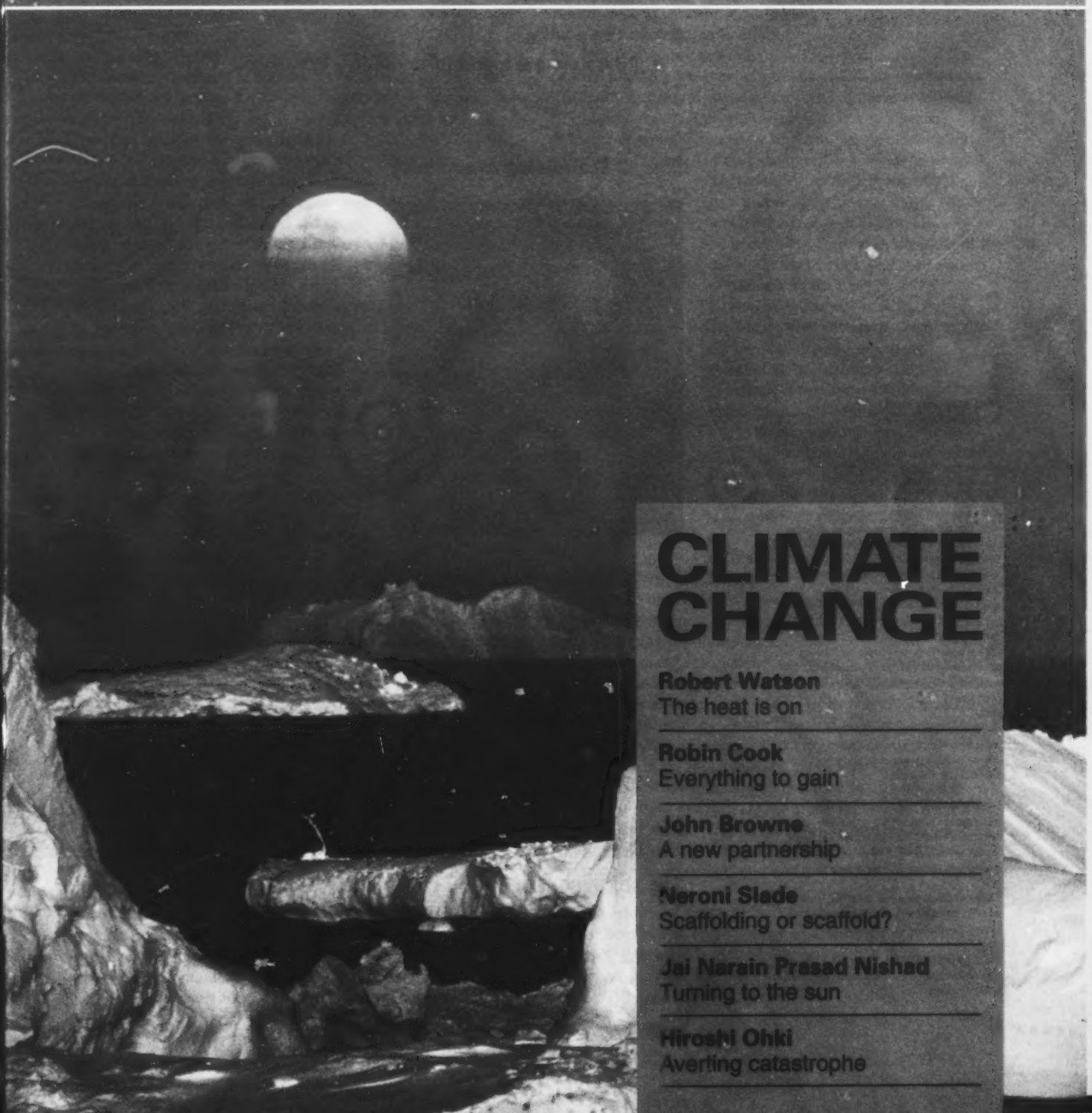

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EDITORIAL

ELIZABETH DOWDESWELL
United Nations Under-Secretary General and Executive Director, UNEP

The last ice age was brought to an end by a warming of the global climate of just a few degrees over the course of thousands of years. Now the global climate is projected to warm up a few degrees more, but this time within the space of just a few decades, promising equally profound consequences for life on Earth.

This should be rather important to us. Some might call it a global catastrophe in the making; a potential crisis requiring precautionary measures. But what is puzzling, not to mention astonishing and frightening, is why it appears that not everyone is taking it very seriously.

If but a handful of scientists warned us that a large meteorite hurtling towards Earth threatened to kill millions of people upon impact and create a dust cloud certain to bring on another ice age within a few years, the matter would command the attention of the world's leaders and receive an urgent and concerted response.

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But when the world is informed that unless greenhouse-gas emissions are significantly reduced, the Earth could, during the next century, warm almost as much as it has over the past 10,000 years, with potentially devastating consequences for people and the environment, it is business as usual. Bold action is strenuously resisted if there are significant costs or inconveniences attached to it. The science is attacked by fossil fuel-related industries. And the diplomats are dispatched with a brief to agree on language that protects what is perceived as the national interest.

Now, just days away from the Kyoto climate discussions, it is clear that there is little convergence towards an adequate response by the governments of the world.

Negotiators may well find language that they can all agree on. For many, that will constitute success. But for anyone who was listening, the world's leading climate scientists announced their consensus opinion that a 60 per cent reduction in carbon dioxide emissions would be the minimum required to avert a global disaster, and everything under consideration for the Kyoto Protocol is woefully inadequate.

The signal of climate change is still barely detectable and it is time for us to agree precautionary measure sufficiently robust to ensure the worst fears are never realized. It is perhaps unfortunate that several states, including those having the historical responsibility for changing the mix of atmospheric gases indicated in global warming, are not proposing control measures that match the risks we face. The reasons are many, principally economic and political. They are not scientific. Only very few deny the link between greenhouse-gas emissions and climate change and the majority of those have clear economic links with the fossil fuel industry.

Kyoto was looked to as an opportunity to make amends for the inaction in the post-Rio period. At best we will have a compromise agreement without the bold targets and tight timetables necessary to limit climate change and slow its onset. So, very regrettably, we must now look beyond Kyoto to a process in which we approach this issue in some new ways.

Clearly, the world is not getting what it needs or expects from the multilateral process. Amid the din of vigorous defences of national interests, very few voices offering self-sacrifice in the name of collective well-being can be heard. There is a vision deficit; a leadership gap; and nothing approaching a whole greater than the sum of its parts.

In my view, there is an urgent need for the world's statesmen and stateswomen to take up this issue personally and see it through. We must break through the barrier that prevents us from contemplating responses to the threat of global warming because of economic implications of inconvenience. The assessments of the Intergovernmental Panel on Climate Change must be accepted as the scientific foundation of the debate and not the subject of the debate. No agreement should be contemplated that is not legally enforceable and carrying penalties sufficient to prevent any Party from gaining competitive advantage through non-compliance. And much greater public awareness and understanding of the issues will be fundamental both to meaningful debate at the national level and to any possibility for consensus.

Reductions are achievable and can be undertaken without great costs or damage to economies. Use of the market forces involving the awarding and trading of carbon credits, sharing of greening technology, developing and applying new and renewable sources of energy, initiating domestic energy saving programmes at the municipal and grassroots levels, particularly in the transport sector and in commercial energy use, and pollution control will quickly bring about the needed savings.

Billions of dollars will be spent when there are dykes to build to hold back the seas and refugees to save and relocate. The less we do now, the faster and greater the change and the greater the expense.

When there is a crisis attributable to climate change there will be a response. There will be no disputing the scientific evidence then. And it will not take as much in the form of statesmanship as it will logistics to respond.

But will it also be too late?•

THE HEAT IS ON

ROBERT WATSON

explains that the decisions taken at Kyoto will affect the world for millennia

The greenhouse effect is very simple. We are increasing emissions of greenhouse gases and thus their concentrations in the atmosphere are going up. As these concentrations increase, the temperature of the Earth rises. This, in turn, leads to changes in the patterns of precipitation and to sea-level rise. And as temperatures, precipitation and sea level change, there is reason to worry about adverse effects on ecological and socio-economic systems, and on human health.

There is now a discernible human influence on the Earth's climate system. If there is no global agreement to try and limit greenhouse-gas emissions, the temperature of the Earth is expected to increase between 1.0 and 3.5°C over the next century. Such a rate of change has not been experienced at any time during the past 10,000 years.

Greenhouse gases last for a long time in the atmosphere. Their long-lived nature means that, if we wait for cause and effect to be established with certainty, the world's climate will inevitably change. And if we do not like that new world, it will take us not years, not even decades, but centuries to reverse the damage. Policy makers must recognize that there is scientific uncertainty in the climate issue. But they must also realize that if they wait for perfect knowledge, it will take hundreds of years to undo the harmful effects. The full ramifications of those changes will primarily be felt by future generations.

The evidence now shows that the temperature has gone up all over the globe. Precipitation patterns have also changed. In some parts of the world, especially in Africa, it has become much drier. However, not only the amount of rainfall, but also its type, has changed. More is now falling in extremely heavy downpours and far less as light rain. It may seem paradoxical, but a warmer world would be expected to have both more floods and more droughts.

Nineteen countries around the world are already under stress for lack of water. This figure is expected to double by the year 2025 even if the climate does not change. With climate change, and the accompanying alterations in precipitation patterns, there will be even greater difficulties with water resources in even more parts of the world.

Dieback and extinction

One-third of all forest species – and two-thirds in the boreal forests of the northern hemisphere taiga – could change in a world warmed by a doubling of carbon dioxide (CO_2) concentrations in the atmosphere. Coral reefs could probably keep pace with sea-level rise, but they cannot live in a world that is two or three degrees warmer, and there would be significant die-back.

The present rate of extinction for birds, animals and plants is already between 50 and 100 times the natural one. If the current rate of deforestation

Ron Giling/Panos Pictures

in the tropics continues this would go up, potentially, to 1,000 to 10,000 times the natural extinction rate within the next 30 years. This would, to say the least, be a major experiment on our ecological systems. Climate change would place yet additional stress on these systems.

As genetic and species diversity is lost, and the types of ecosystems are changed, the goods and ecological services which are so important to sustainable development would be threatened. For example, the bio-geochemical cycling of the Earth will alter. This will in turn change inputs of CO_2, methane and nitrous oxide and hence have a feedback effect on the Earth's climate system.

Global agricultural production is not expected to be threatened in a warmer world. But there will be more production in the high latitudes of the northern and southern hemispheres and far less in the tropics and sub-tropics where there is already famine. In a world with doubled CO_2 concentrations harvests in these areas would fall by up to 30 per cent, particularly in Africa and Latin America.

Our best estimate of sea-level rise is 50 centimetres over the next century. It could be as high as 1 metre, or as low as 15 centimetres. But once the process is set into motion, it cannot be slowed down in anything less than a few millennia. A sea-level rise of up to 1 metre will displace tens of millions of people in the low-lying deltaic areas of Bangladesh, Egypt and China. Bangladesh could lose as much as 18 per cent of its land surface and suffer a significant decrease in agricultural productivity. Whole cultures, such as small-island states, could be wiped out.

Vulnerability to change

Though most of the emissions of greenhouse gases have been put into the atmosphere by the developed world, it is the developing countries that are particularly vulnerable to climate change. The costs would be extremely significant for some parts of the world. Deforestation and agricultural and industrial processes all affect greenhouse-gas emissions. Land-use policies and practices have a major effect on climate change, and they have altered considerably. Between 1961 and 1988, for example, the amount of arable land in Latin America increased by 36 per cent while the amount of forests and woodlands fell by 11 per cent. There are very similar trends in Africa and parts of Asia.

Science can only inform policy makers. It cannot and should not make decisions

Industrialized countries would not escape altogether. Large segments of the Everglades in Florida, for example, would totally disappear if sea levels rose by 1 metre. There would also be a significant change in the structure of forests of the east coast of the United States. Neither sugar maples nor beeches would survive. At present, beech trees range all the way from Florida up to Canada, but in a world with doubled CO_2 concentrations they would be restricted to Canada, and the situation would be very similar for sugar maples.

In fact all this is almost an optimistic view of the world of the future. Limiting the concentrations of CO_2 to just a doubling will be an extremely difficult task. To achieve this, the governments of the world will have ▶

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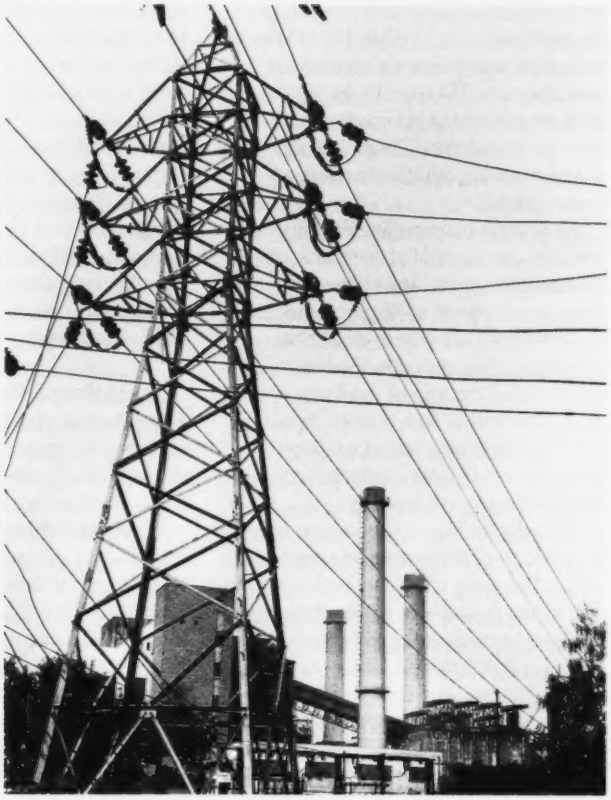

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to agree on some fairly strict limitations on greenhouse-gas emissions in Kyoto. If they do not, there is no reason to believe that the concentrations will not triple or quadruple.

The extent to which climate will change in the future will depend on, among other things, the number of people on the Earth in the next few decades, economic growth rates, energy prices, and what policies are adopted to try and get new energy technologies into the marketplace.

The very rapid rise in the world's population since the 1800s – and the increase projected for the future – is an extremely important factor. It is now recognized that empowering women, through education and enabling them to get credit for microenterprises, is absolutely critical in reducing population growth.

The insatiable appetite for energy services is another key driving force. Countries in North America and Europe, for example, could produce and use energy much more efficiently and much more cleanly. Increased energy consumption in developing countries is absolutely essential if poverty is to be alleviated. Hence the challenge is to meet the energy services needs in the most environmentally friendly manner.

The bottom line is that meeting human needs, with present practices, is causing environmental degradation. And the environmental degradation then threatens our ability to meet human needs. A holistic approach is required, concentrating on meeting human needs while protecting the local, regional and global environment. Only then can the vision of sustainable development be realized.

Redoubling efforts

At the time of the negotiation of the Montreal Protocol – which will protect society against the harmful consequences of stratospheric ozone depletion – there were some sceptics who pointed out uncertainties in the ozone computer models and argued that the world should wait for much better knowledge before taking action. These sceptics were absolutely right about the models. They *were* inaccurate: they significantly underestimated the effects of human activity on stratospheric ozone. Hence, even with the Montreal Protocol – and all the strengthening amendments and adjustments to it of the past 10 years – we will have to live with stratospheric ozone depletion over most of the globe for at least another 50 years. Some of the same sceptics are now saying that we do not know enough about climate change to take action to combat it.

There are, of course, many scientific uncertainties – but there is no doubt that humanity is affecting the global environment. We must therefore redouble our research efforts. But, even more important, we must redouble our efforts at moving towards political solutions.

Science can only inform policy makers. It cannot and should not make decisions. It will take political will to protect the Earth's climate system. Kyoto is a milestone, testing the ability of governments to address this complex, but critical, global issue•

Dr. Robert Watson is Director of the Environment Department of the World Bank and Chairman of the Intergovernmental Panel on Climate Change.

Everything to gain

ROBIN COOK,
describing global warming as a threat without parallel, says that those that move to combat it now will gain economically as well as environmentally

A British newspaper recently described one of my ministerial colleagues' public statements on climate change as 'apocalyptic'. Perhaps the newspaper was right. But my colleague made no apology for being direct about the potential impacts of climate change, and neither do I. December's climate change negotiations in Kyoto – the Third Conference of the Parties to the United Nations Framework Convention on Climate Change – are among the most important we will ever hold.

They are important because of what is at stake. The disruptive effects of climate change could be literally dreadful. We witness examples almost every week of the disasters which climate change may make more frequent and more damaging: drought and famine in Papua New Guinea; hurricanes and floods in Latin America. The Intergovernmental Panel on Climate Change (IPCC), the United Nations' group of leading climate scientists from developed and developing countries, have been looking at the effects of climate change by region and sector. Their report, which will issue just before Kyoto, illustrates what may happen if we take no action to fight climate change. It points out some positive effects of climate change. But even taking these into account, it makes grim reading. The IPCC predicts that during the next century, the average rate of warming will be greater than anything seen in the last 10,000 years. Global mean sea level could rise by at least 15 and perhaps as much as 95 centimetres. Surface temperatures will increase by between 1.0 and 3.5°C.

The numbers are dramatic, but the predicted effects even more so. No region of the world will be unchanged. The following are only a very few examples from a 20-page summary of the IPCC's work. In Europe, we could see more animal and plant species under threat; in Africa and Latin America, increased disease. Food production in Latin America will go down. North America could lose as much as 50 per cent of its coastal wetlands, and East Asia suffer more acute water shortages.

Any one of these reasons on its own would be cause for concern. Taken together, they constitute a global threat without parallel. That is why Kyoto needs to agree measures ▶

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Heldur Netocny/Panos Pictures

which will achieve significant cuts in greenhouse-gas emissions by developed countries. The target proposed by the European Union (EU) of a 15 per cent reduction from 1990 levels by 2010 is realistic. The United Kingdom has set itself a target of a 20 per cent reduction in carbon dioxide emissions with the same timetable. We will put together our own climate change programme post-Kyoto. The technology and measures for these significant reductions are available. What is needed from the leaders of all developed countries is political will.

Every region of the world will be affected by climate change. The benefits of measures to mitigate its effects will also be felt by us all. But the need to take action on climate change is driven by principle as well as by practical need. Developed countries are historically responsible for most of the world's greenhouse-gas emissions. We have a duty to pass on to our children and theirs a world which can support the quality of life we want them to have. It is no less our duty to help the poorest citizens of the world out of abject poverty and to make sure that no-one is forced to sacrifice their own health and that of their environment in the world's pursuit of economic growth.

Sean Sprague/Panos Pictures

That is one reason why it is so important that developed countries should keep to their agreement to lead the way on climate change. We cannot lecture developing countries about the importance of protecting the environment from behind the luxury of our own high living standards and expect to be taken seriously. We have to be prepared to show that we recognize the aspirations of people in developing countries to a better quality of life.

Countries which act now to bring down their emissions will be getting out ahead of the competition

There is another, more pragmatic reason why developed countries need to lead the way at Kyoto. In future, most greenhouse-gas emissions will be from developing countries. Because of that, in the long term, all countries will have to be full players in the fight against climate change. We will not convince developing countries of that unless developed countries have already set the pace. The ultimate objective of the Convention on Climate Change is to achieve a stable level of greenhouse gases in the atmosphere that will avoid dangerous interference with the climate system. Even stabilization at a little above present levels will require significant cuts in global emissions next century. The dilemma facing us is how to achieve that at the same time as improving living standards throughout the developed and developing worlds.

It is difficult to blame those leaders whose global vision fades in the face of such a challenge. But the problem is not as impossible as it seems. The general assumption has been that countries who take steps to protect the global climate are making a sacrifice for the sake of the greater global good. More and more, experience and economic analysis show us that assumption is wrong. Such countries are helping their own economies directly as well as improving their own and the global environment. A report commissioned by the United States Department of Energy demonstrates that companies can reduce their emissions through energy efficiency measures and save costs. Capital turnover during the next 15 years will allow industry to introduce cleaner technology with lower emissions at little extra cost. Other reports have shown how, handled properly, measures to reduce greenhouse-gas emissions can enhance economic growth. Lower emissions are often coupled with other environmental improvements, such as better air quality.

No one really doubts that in the long run we shall all have to reduce our greenhouse-gas emissions. That will include developing country involvement as well as developed country targets, as Kyoto will have to realize. Countries which act now to bring down their emissions will be getting out ahead of the competition. Technology already offers us solutions. The countries that develop and make that technology will give their companies a lead and the chance to develop materials and skills which in the long run will be needed in markets throughout the world.

This is a truth increasingly recognized by the private sector as well as by governments. In the run-up to Kyoto it means that countries who have been focusing on the costs which action on climate change will involve should instead be looking positively at the benefits they will gain. We do not know what the outcome of Kyoto will be: this is a negotiation and it is important that we come away from the Conference with a Protocol and a plan of action on which everyone can agree. But the United Kingdom and the EU more widely will be arguing strongly for the most effective legally binding targets available. The EU countries know they can achieve their target. And they know it will benefit them to do so.

It has been clear for a long time that it is in our joint interests to take action to help the fight against climate change. We now know that it is in our individual interests too. When the world's environment ministers come to Kyoto in December, they will know they are playing for high stakes. But this is not a zero-sum game. We can all lose. Or we can all win•

The Rt. Hon. Robin Cook M.P. is Secretary of State for Foreign and Commonwealth Affairs, United Kingdom.

A new partnership to make a difference

JOHN BROWNE calls for industry to meet the challenge and opportunity of global warming and outlines what his oil company is doing

At the end of the 1980s following the collapse of communism in Europe and the fall of the Soviet Empire, the American academic Francis Fukuyama wrote a book with the ironic title *The End of History*. A decade later we can see that history did not cease. But it has changed character. In the post-communist world rigid left-right ideology is no longer the ultimate arbiter of analysis and action. Instead we are coming to realize that we are all citizens of one world.

With this realization has come growing acceptance that all of us – governments, companies, non-governmental organizations and individuals – must take greater shared responsibility for the future of the planet and its sustainable development. Global warming has proved a catalyst in this trend. For too long climate change has been shunted aside by those in positions of power and influence. Its very ambiguities seemed to offer an excuse to leave it to someone else. Now, increasingly, a consensus is emerging that no one should ignore the challenge. We must all work together to take precautionary action.

Maintaining equilibrium

Collective responsibility is a corporate goal too – not least in the oil industry. To be sustainable we need a sustainable world. This means a world where the environmental equilibrium is maintained and the population enjoys the heat, light and mobility which the industry helps to provide. These are not incompatible goals. No commercial organization can be really successful unless it has the capacity to keep using its skills and growing its business. That requires a competitive financial performance. But corporate leadership also requires realism. And that means responding to demands and concerns.

At British Petroleum (BP) people want to feel good about the company. They want to believe BP is a positive force in the world. In restaurants or at their children's schools, they do not want to hear that the company is ruining the world. The same is true of our customers. Moreover, denying the concern does not make it go away. Using uncertainty as an excuse for doing nothing only marginalizes us in an important and rapidly moving debate. Global warming is a fundamental strategic challenge to the oil industry and we need to be constructively engaged.

Two broad approaches are possible. One is dramatic, sudden and wrong – drastic restrictions on carbon emissions or a ban on the use of fossil fuels, for example – both of which are unsustainable because they would crash headlong into the realities of economic growth and expectation. The other is gradual and constructive and involves partnership with anyone who can make a difference. We are committed to this second course at BP.

Business is based on facts. Two

Heldur Netocny/Panos Pictures

facts about climate change are clear. The concentration of carbon dioxide (CO_2) in the atmosphere is rising, and the temperature of the Earth's surface is increasing. The conclusion of delegates from 96 countries at the 1995 Intergovernmental Panel on Climate Change was unanimous: 'The balance of evidence suggests a discernible human influence on global climate.' Over the next century, predicted the IPCC, temperatures may rise by a further 1.0 to 3.5°C and sea levels by 15 to 95 centimetres. Some of that impact is probably unavoidable because it results from current emissions.

The British Petroleum Company plc

Energy demand rising

Meantime the world population is swelling, living standards are growing and demand for energy shows no sign of slackening. By 2010 there may be 1.3 billion more people on Earth – equivalent to another China. By then energy demand is likely to be more than 30 per cent higher than in 1997 – another 2.5 to 3 billion tonnes per annum of oil equivalent, or extra demand equal to twice Europe's present consumption.

The steps we are proposing are substantial and measurable...

A few qualifications are also in order. Of total CO_2 emissions caused by burning fossil fuels only one-fifth comes from transportation. Four-fifths come from static uses of energy – the energy we use in our homes, factories, offices and power generation. Of the total, less than half – 43 per cent – comes from petroleum. In addition there are wide margins for error in all these predictions; the science of climate change is still very provisional.

Inevitably, any remedial actions BP takes by itself will have limited impact. As a company our own operations in exploration, refining and chemicals produce around 9 million tonnes of carbon annually. Even if you add carbon produced by the consumption of products we make, the total is 95 million tonnes – just 1 per cent of total CO_2 emissions.

Still, the steps we are proposing are substantial and measurable. First, we plan to improve our own CO_2 emissions record. Over the last decade we have favoured the indirect approach, achieving 20 per cent improvements in the energy efficiency of our major manufacturing processes. Now we aim to better this record by setting specific targets across BP and creating a ▶

Ken Gilroy/Still Pictures

monitoring process based on benchmark data. Some of the targets will be straightforward matters of efficiency such as the reduction of gas flaring. But others – like our efforts to remove CO_2 from large compressors – require new investment.

Beyond this we aim to boost the support we give to scientific research on climate change. Through technology transfer and joint initiatives with other organizations, including governments and environmental groups, we hope to promote a dialogue with all those seeking answers to the climate change problem. Linked to this, we intend to contribute to the public policy debate on global warming, not least by arguing that any approach be anchored in market-based concepts rather than regulation. We also intend to step up our efforts to make alternative energies, such as solar power, commercially competitive.

Working together

Already BP has plenty to show for these commitments. Joint implementation is still in its infancy but we have begun by entering a reforestation programme in Bolivia with three other partners. We are working with the Environmental Defense Fund in America to develop a voluntary emissions trading system, and have joined a partnership with the Electric Power Research Institute and the United States Department of Energy to design the right technology strategy to deal with climate change. BP is also part of a project set up by the International Energy Agency to analyze technologies for reducing and offsetting greenhouse-gas emissions from fossil fuels. Meanwhile BP Solar, with operations in 16 countries, has built up a 10 per cent share of the world market for solar power.

The key to initiatives like these is that they succeed. This is where business has an opportunity and a responsibility. It is what BP and others in the oil industry have done in terms of health and safety. It is what BP, in particular, does in response to local environmental issues in places such as Alaska's North Slope and Wytch Farm in southwest England – using our skills to meet requirements set by local communities as well as public policy. We should adopt the same approach to global warming.

The people of the world must now be convinced that their needs can be met without destructive consequences

It would be unrealistic, however, to suppose that industry will be left alone to tackle climate change. Governments everywhere are taking an active interest in the topic as public concern grows. Increasingly their focus is on three policy instruments – taxation, carbon trading and joint implementation. Each idea relies on the market to change conduct. How effective they prove will depend on the detail and particularly the incentives for action built into any initiative.

Taxation, of course, is a matter for national governments. It is not a simple tool to use and it has an undoubted impact on behaviour and distribution and economic activity. From our perspective, the test of any tax should be the impact it has on reducing greenhouse-gas emissions. To be effective, such taxation should cover all industry sectors, be based on a level playing field between fuels and be used to give manufacturers and consumers the opportunity as well as the incentive to reduce emissions.

An open market

The second option is the development of a carbon trading system which puts a value on carbon emissions, allocates permits for emissions and sets up a mechanism to trade them on an open market at competitive prices. A company's permit holdings would become one element in business planning. Again the playing field should be level between industries and fuels. The United States already operate two domestic permit trading systems. One aims at curbing sulphur emissions, the other at phasing out ozone-depleting substances. Since the sulphur trading system began in 1992 there has been a 5.6 million tonne reduction in emissions with the prospect of a further 4.4 million tonne improvement by 2010.

The third option – that of joint implementation – really means taking

It would be unrealistic to suppose that industry will be left alone to tackle climate change

effective action in places where the impact is likely to be greatest. Defining how emerging markets should respond to global warming is a highly political issue. We have to be alive to the reality that it is hard for countries to concern themselves with climate change when they lack clean drinking water. My answer is that by targeting things which can be improved at lowest cost, thereby encouraging technological progress, we can also help control pressing environmental problems like inner city pollution.

Global involvement

What matters now is that we begin to take rational, precautionary, cooperative steps – even if there are areas of uncertainty and disagreement. The Kyoto Conference is important but it should be seen as one step on a long road. If the meeting pursues the chimera of a single solution, it will fail. Success, in my terms, means involving the whole world. But if a target is set for an overall reduction in emissions it will be merely the beginning of the next process – developing the means to achieve that target.

Oil and gas will remain prime energy sources for many decades to come. Demand for energy is growing, and although renewable sources of supply such as solar have excellent long-term potential, it is clear that for the foreseeable future the world will be using oil and gas in increasing quantities. But the people of the world must now be convinced that their needs can be met without destructive consequences for the planet. To Francis Fukuyama, such sentiments are part of the growing sense of common interest which is driving global society following the end of the Cold War. At BP we are part of this trend. We believe we should heed popular expectations and help make a difference. History has not ended. It has moved on•

John Browne is Group Chief Executive of British Petroleum.

Scaffolding or scaffold?

Gerard and Margi Moss/Still Pictures

NERONI SLADE argues that the Convention on Climate Change remains an empty framework, imperilling the survival of small island states

Climate change threatens the very life force of small island developing countries. They will be the first to face the full impact of global warming. They are the most vulnerable to climatic change, and its consequences would be particularly disastrous for them, though they emit little of the greenhouse gases themselves.

The impacts of sea-level rise pose the greatest threat to the small island nations. In some island groups, like Kiribati, Seychelles and Maldives, more than 80 per cent of the land area is less than a metre above present sea level. Such low-lying islands are particularly vulnerable, but high islands will also be badly affected by the likely impacts on their people, economic activity and infrastructural development as a whole.

The ocean exerts a strong influence on a small island, moderating and influencing its weather. In most cases, over half of the population resides within 2 kilometres of the coast, increasing vulnerability to sea-level rise. Economic activities are frequently dominated by specialist agriculture – such as sugar cultivation – and by tourism, both of which are strongly influenced by climatic factors.

Small island developing states already suffer disproportionately from extreme occurrences, as has been shown by the loss of life, agricultural losses and damage to property, infrastructure and utilities associated with recent hurricanes in the Caribbean, and similar events in the Pacific. They are likely to experience considerable economic, social and cultural dislocation should the frequency and/or intensity of these events increase.

Even a sea-level rise of 20 centimetres or less can have devastating impacts on many small islands. A rise of 50 centimetres or more would have even more severe implications. Low-lying atolls like Tokelau, Marshall Islands, Tuvalu, Maldives and Kiribati would be rendered uninhabitable. Major population displacements would be experienced in Micronesia, Palau, Nauru, French Polynesia, Cook Islands and Tonga, among others. Small islands with extensive coastal plains and little highland, such as Barbados, Antigua and Barbuda and the Bahamas would also be highly vulnerable.

A case study of the likely impacts of an accelerated 1-metre rise in sea-level by 2100 on the Marshall Islands has shown that between 10 and 30 per cent of the shoreline would be eroded or forced back and 60 per cent of its arable land would be lost. There would be a significant increase in the frequency of severe floods and a reduction in the underground fresh water on which the Islands depend. The cost of protecting the coast is estimated to be four to six times the country's current gross domestic product.

Formidable complications

Climate change presents decision makers in small island states – who, of course, do not have the capacities and resources of developed countries – with a set of formidable complications. It exacerbates most of their other numerous environmental problems and many current social, cultural and economic concerns. ▶

Extensive and significant impacts are also projected for coastal zones throughout the world. A 50-centimetre rise in sea level would lead, for example, to the loss of 17 per cent of Bangladesh, home to 6 million people, as well as inundating up to 80 per cent of Majuro Atoll, where a large part of the population of the Marshall Islands lives. A similar fate could befall the Nile Delta in Egypt, while some 23,000 square kilometres of Florida, Louisiana and other coastal areas of the United States would be flooded.

Coastal infrastructure worldwide, and hence the global property insurance industry, are especially vulnerable both to sea-level rise and to the more frequent severe storms expected with global warming. These would also erode shores and habitats and increase the salinity of estuaries and freshwater acquifers.

There will be severe economic dislocations, loss of life and livelihoods, and declines in productivity – placing an additional burden on developing countries and their most vulnerable people. Many millions will be displaced, and as the Intergovernmental Panel on Climate Change (IPCC) has warned, 'entire unique cultures may be obliterated'.

Ambitious targets

For small islands the issue is one of survival. Their common and shared vulnerability was a strong motive in establishing the Alliance of Small Island States (AOSIS) in 1990. This now numbers 42 members from Africa, the Atlantic, Caribbean, Mediterranean, Pacific and South China Sea. AOSIS took early action in 1994 to propose a 20 per cent reduction from 1990 levels of carbon dioxide (CO_2) emissions by developed countries by 2005. This remains, not surprisingly, the most ambitious target and timetable on the agenda for Kyoto.

AOSIS believes that the guiding objective of the protocol or other legal instrument to be finalized in Kyoto should be

For small islands the issue is one of survival

to ensure that the global average temperature does not exceed 2°C above the pre-industrial level, and that the resulting global mean sea-level rise does not exceed 20 centimetres above 1990 levels.

In the seven years since the first resolutions on global warming of the United Nations General Assembly, the international community has created an array of bodies dedicated, in whole or in part, to combating climate change. These enjoy the participation of the vast majority of the world's governments, which, at the highest level, have repeatedly recognized the urgent need for action. And yet the Framework Convention on Climate Change remains an empty scaffolding. Few governments can point with candour to a single significant shift in policy towards the Convention's objective, and global greenhouse-gas emissions continue to rise unchecked.

The apparent lack of political readiness to react to the scientific evidence and to what is clearly happening to the global climate gives cause for concern. Reports of change in the world's climate have been with us for some 15 or 20 years. New record-setting weather extremes now seem to be commonplace.

The 10 hottest years in recorded history have all occurred since 1980. The World Meteorological Organization identified 1996 as the 18th consecutive year with positive global temperature anomalies. And in its *Second Assessment Report*, in 1995, the IPCC announced that the Earth had entered a period of climatic instability likely to cause 'widespread economic, social and environmental destruction over the next century'.

Gerard and Margi Moss/Still Pictures

The IPCC continues to tell us that it is imprudent to gamble with the future. The reductions implied by the AOSIS target are in the order of what must be aimed at in the short to medium term to avoid imposing draconian measures at some future date. Experts agree that such reductions are feasible and achievable with existing technologies and measures. Conservation and improved management practices alone can increase energy efficiency by 10 to 30 per cent over the next two or three decades, while using the most efficient current technologies could bring gains of 50 to 60 per cent. At worst, the costs of these steps will be very modest, and they could well provide positive economic benefits.

The future scenario that unfolds from the IPCC's findings may not register as a priority in the short-term mind-sets of most diplomats and policy makers. The lag-time in the planet's ecological

systems will undoubtedly delay essential decisions. And the political and economic powers that depend upon the production and use of fossil fuel are among the most deeply vested interests civilization has ever known.

The international negotiations, moreover, must somehow accommodate interests as diverse as those of Saudi Arabia and Samoa, and provide solutions that will not just gain acceptance amongst diplomatic representatives but convince legislatures, industry, consumers and producers.

But sectoral interests must be balanced against those of the planet and of humankind as a whole. The Convention places a common responsibility on all countries, developed and developing, to 'protect the climate system for the benefit of present and future generations'.

Science has confirmed that the main responsibility for the concentrations of greenhouse gases in the atmosphere lies with those countries that have grown rich on the extraction and use of fossil fuels. Developing countries feel that, with this wealth, industrialized countries have also built the technological and financial capacity to take effective action to combat climate change – while they themselves require time and space to develop their own economies.

Industrialized countries see matters differently, pointing out that because many developing countries are growing rapidly, their emissions will significantly exceed those of the industrialized nations within 25 years unless effective action is taken.

Ready for change

We all need to make essential adjustments. The call on developed countries to change their unsustainable lifestyles, consumption and production patterns is the more often heard. But so must developing countries, whose economic development is following the same unsustainable and polluting paths. And so must countries like mine which, like it or not, are already beginning to bear the impacts of climate-related disasters in the form of storms which devastate livelihoods and infrastructure and retard sustainable development.

Many of these changes must be made swiftly, since it is now clear that even if greenhouse gases were stabilized tomorrow, temperatures may still increase by 0.5°C, committing us to several centimetres of sea-level rise. Yet the argument is often heard that it is best to delay actions since this might reduce the overall costs of mitigation because of potential technological advances – the 'wait and see and then sprint' approach.

This disregards the fact that a whole range of options and technologies for limiting emissions already exists, and that the longer action is delayed the more impacts can be expected within a compressed time frame, allowing less time to adapt.

The evidence from the IPCC is that immediate and substantial cuts are needed if the concentration of CO_2 in the atmosphere is to be stabilized by the end of the next century. If emissions are to be held at twice pre-industrial levels, they will eventually have to be less than half what they now are. The IPCC has also shown that it is possible to reduce emissions with little or no negative impact on economies.

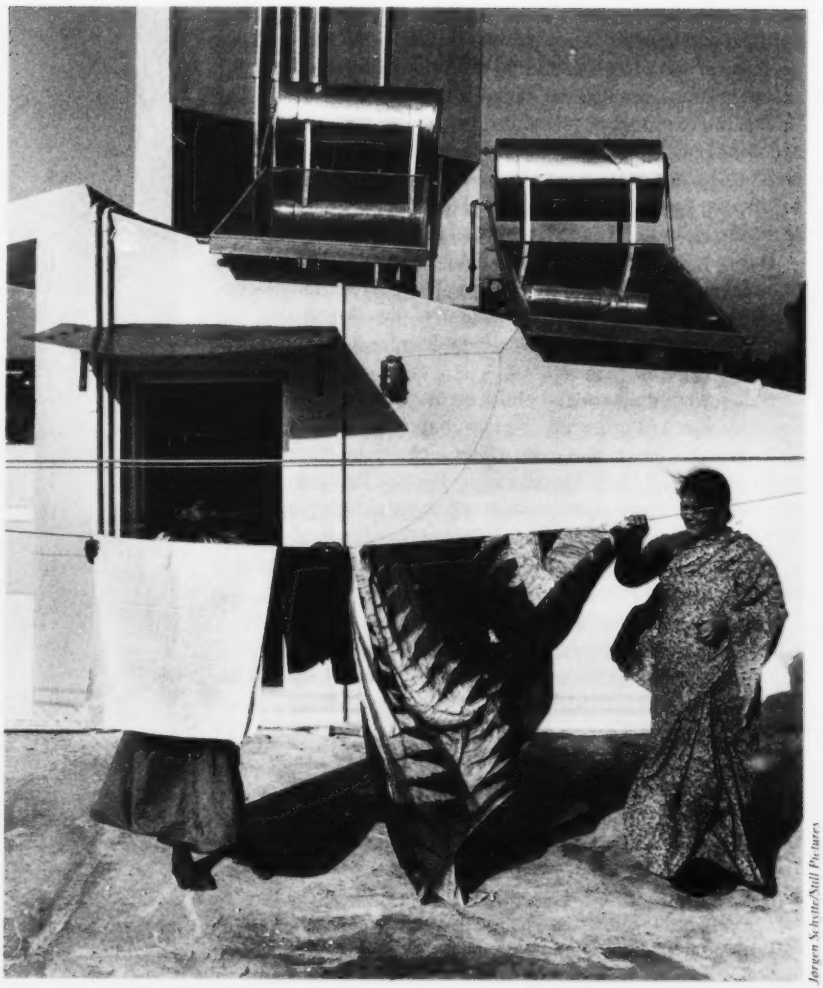
The industrialized market economies – which possess the economic and technical capabilities – should act together to reduce greenhouse-gas emissions and demonstrate the potential of the so-called 'no-regrets' opportunities. This could include the reduction or elimination of subsidies amounting to $250 to $300 million per annum worldwide which encourage higher greenhouse-gas emissions. Their removal would send a powerful market signal to spur research and development of alternative renewable energy sources.

Dominic Sansoni/Panos Pictures

Early action by industrialized economies would provide opportunities for the developing countries to gain timely and efficient access to any advances achieved and to avoid mistakes made, or difficulties encountered, through a process of technological 'leap-frogging'.

Small island states cannot contemplate failure to take immediate action which the IPCC has repeatedly described as technologically feasible and economically beneficial. For us the precautionary principle is an ecological and moral imperative. Our very strong contention is that there is a clear and demonstrated need to take immediate action •

H.E. Tuiloma Neroni Slade is Ambassador of Samoa to the United Nations and Chairman of AOSIS.



Jørgen Schytte/Still Pictures

TURNING TO THE SUN

JAI NARAIN PRASAD NISHAD outlines India's strategy for conserving fossil fuels and mitigating climate change by developing renewable sources of energy

Our expanding economy, and the strong growth expected in the next few decades, will require additional energy. The use of fossil fuels is likely to dominate our strategy for meeting these needs in the near and medium term. However, our own reserves are finite and will only be available for a limited period – about 150 years in the case of coal, and about 15 years for oil. Their price will rise steadily as production and availability become increasingly constrained. We need to adopt measures to conserve the scarce fossil fuels that are available to us in view of their strategic importance to the country.

Such measures could lead to increased import of fossil fuels, severely straining our foreign exchange reserves. Besides, the use of fossil fuels is not sustainable and is directly linked to environmental problems, particularly CO_2 emissions and climate change. We will therefore need to cut back on their use for energy generation. Renewable energy sources, such as solar, wind biomass and small hydro, are all indigenous and cannot be depleted. Exploiting them can make significant contributions to improving energy supplies in our country: they can bring down the requirement for imported fuels, are environmentally benign, and are compatible with the overall strategy for sustainable development.

Technological solutions

The importance of the increasing use of renewable energy sources was recognized in India in the early 1970s. During the past quarter century, a significant effort has gone into the development, trial and induction of a variety of technologies for use in different sectors. Today, India has one of the world's largest programmes for renewable energy. Our activities cover all the major renewable energy sources of interest to us, including biogas, biomass, solar, wind and small-hydro power and other emerging technologies. Several systems and products are now commercially available, and are economically viable in comparison to fossil fuels.

Providing energy for cooking in rural areas has been a major achievement. Two and a half million family-sized biogas plants (second in number only to China's) and 27 million improved wood stoves have been established. These are saving over 15 million tonnes of fuelwood every year. In addition, 3.2 million tonnes of enriched organic manure are produced from the biogas plants to supplement and complement expensive and environmentally degrading chemical fertilizers.

Solar thermal technologies are now finding ready acceptance for a variety of applications. About 400,000 square meters of collector area has so far been installed, ranging from domestic water heaters with capacities of 50 to 100 litres in about 25,000 homes, to industrial and commercial systems with capacities of up to 240,000 litres of hot water per day. Nearly half a million box-type solar cookers are also in use.

Photovoltaics is a simple, reliable and environmentally benign technology which is immediately available for providing electricity to our widely dispersed households and settlements. Over 400,000 solar photovoltaic systems, amounting to about 28 megawatts (MW), have so far been installed in India. They involve around 25 different types of systems

for rural, remote area and commercial applications, including home and street lighting, water pumping and rural telecommunication systems. Solar lighting systems are now being used in 180,000 homes and are contributing to substantial savings in kerosene. About 150,000 rural radio telephones are also being powered by solar energy.

Grid quality power generation from wind, small hydro and biomass has now attained maturity. India's wind-power capacity of 925 MW ranks third in the world. Small-hydro power generation, which is particularly suitable for remote hilly regions, and in Ladakh and the northeastern states, is being expanded. We are implementing the world's largest bagasse-based cogeneration programme in our sugar mills. There is also considerable scope for extracting energy from urban and industrial waste. A total power generating capacity of about 1,200 MW has so far been added from renewables, most of it through commercial projects.

A large domestic manufacturing base has been established for renewable energy systems and products. India is the world's second largest producer of single crystal silicon solar cells. It produces 9 MW of modules per year – 10 to 12 per cent of world production. About 75 companies are involved in producing cells, modules and systems, and over 100 companies are involved in the local production of such solar thermal systems as solar cookers and water heaters. Twelve companies are actively engaged in the phased indigenous production and assembly of wind turbines under joint ventures or licensed production. Gasifiers of up to 500 kilowatt capacity are also being manufactured indigenously. The annual turnover of the renewable energy industry in the country has reached a level of over $0.5 billion.

The spread of renewable energy technologies has been aided by a variety of policy and support measures. India is the only country in the world with a ministry – the Ministry of Non-Conventional Energy Sources – that concentrates on them exclusively. India's Renewable Energy Development Agency was established as the only agency of its kind in the world to finance renewable energy projects. Incentives include soft loans, concessional rates of customs duty, exemption from excise duty and accelerated depreciation benefit to commercial users. Subsidies are available on some products, especially those used in rural areas such as improved *chulhas*, biogas plants, solar lanterns and home lighting systems.

Our country has the potential to emerge as a truly global player in the renewable energy sector

We have worked closely with state governments and electricity boards to provide remunerative power purchase agreements and arrangements for the wheeling and banking of power so as to encourage its generation from renewable energy.

Heldur Netoverv/Panos Pictures

A significantly expanded programme will be taken up in the country during the Ninth Five Year Plan (1997-2002). Another 1.5 million biogas plants and 25 million improved wood stoves are envisaged to provide cooking energy. A total solar photovoltaics capacity of 100 MW – including 1 million solar lanterns, 500,000 home lighting systems, 10,000 solar pumps – as well as 55 MW for commercial applications and exports, has been proposed. Targets have also been proposed for 500,000 homes to be provided with solar water heaters, leading to a saving of 500 MW peak power, and for 500,000 square metres of solar collectors for industrial systems. An additional power generating capacity of 3,000 MW from renewables is also proposed.

Collaborative ventures

We are in a position to undertake consultancy, organize training programmes and establish projects in other developing countries on the basis of 'technological cooperation between developing countries' in view of their similar conditions and requirements. We can also undertake joint projects in third countries in partnership with industrialized nations using bilateral or multilateral financial assistance. A major drive has been launched to export our products, systems, technologies and services to our neighbours and other developing countries, particularly in Southeast Asia, West Asia and Africa. Several initiatives have already been taken in this direction, particularly in the area of solar photovoltaics.

At the end of the Eleventh Five Year Plan, in the year 2012, some 10 per cent of the total installed power generating capacity in the country is likely to be based on renewables. A comprehensive renewable energy policy and a separate legislation is being prepared for accelerated thrust to the development of this sector. Our country has already achieved a leadership position and has the potential to emerge as a truly major global player in this sector•

Captain Jai Narain Prasad Nishad is Minister of State for Non-Conventional Energy Sources, Government of India.

A MATTER OF CONVENTION

MICHAEL ZAMMIT CUTAJAR examines the philosophy behind the Convention on Climate Change and the role that the Kyoto Conference will play in reaching its goal

The world is watching the industrialized countries closely for signs that they will demonstrate moral leadership at December's Kyoto climate summit. Will they make a legally binding pledge to cut their greenhouse-gas emissions significantly below 1990 levels during the first decade of the 21st century? What will be the groundrules for making and measuring these reductions? What measures will governments put into place to motivate the private sector and public opinion to become more climate-friendly? These countries are expected to take the lead in combating climate change and its adverse impacts because, as stressed by the 1992 United Nations Framework Convention on Climate Change itself, the largest share of historical and current emissions originates in developed countries. They therefore accepted a non-binding commitment to aim at returning their emissions to 1990 levels by the year 2000.

A step at a time

Most will not achieve this aim, and it was agreed in 1995 to launch new talks for stronger developed country commitments for the early years of the 21st century. In Kyoto they are expected to make a legally binding pledge to cut their emissions to below 1990 levels by the year 2010. Only after these cuts begin to be made will additional commitments by developing countries be reasonably considered.

The Climate Change Convention was conceived in just this spirit, as a continuing process for adding new commitments and strengthening actions step by step. Clearly, the Kyoto agreement will not by itself secure the Convention's long-term objective of stabilizing atmospheric concentrations of greenhouse gases at a safe level. This (unspecified) level should permit ecosystems to adapt naturally while ensuring that food production and sustainable development are not undermined.

Proof unnecessary

The need for new commitments and a decision about just what constitutes a safe level are based in large part on science. Opponents of reducing emissions often argue that the science is too uncertain to justify early action. But many environmental problems, such as damage to the ozone layer and pollution of the oceans, could not be confronted if final proof of cause and effect were required. In response, the international community has come to accept the 'precautionary principle' under which activities that threaten serious or irreversible damage can be restricted or even prohibited before there is absolute scientific certainty about the effects.

The Convention serves as a yardstick for assessing achievements and new actions

The Kyoto negotiators are drawing on the best current scientific, technological and economic understanding of climate change. The cuts they agree are likely to be modest and to be largely achieved through 'no-regrets' solutions that offer both economic and environmental benefits, such as reducing market-distorting subsidies and urban smog. As scientific understanding of climate change improves – as it will – governments can decide later to accelerate or roll back these efforts, as appropriate.

Team spirit

The Convention is based on a cooperative rather than a confrontational approach – it assumes that countries can successfully tackle problems such as climate change only if they work together as a team. This cooperation is based on the principle of 'common but differentiated' commitments and the recognition of the differing capacities of developed and developing countries. This includes the recognition that a rise in developing country emissions must be expected as their economies develop. Cooperation must include the sharing of technology, especially in the energy, transport industry, agriculture, forestry and waste-management sectors, which together produce nearly all greenhouse-gas emissions attributable to human activity. We must find cleaner sources of energy, cleaner motor vehicles, industrial processes that are more efficient and a more productive agriculture for the same amount of resources invested. Such technologies must be made widely available; they must somehow be shared by richer and more scientifically advanced countries with poorer countries that have great need of them.

Just beginning

This philosophy of continuous revision, reliance on science and international cooperation will continue to shape the international response to climate change in the years after Kyoto. An agreement in Kyoto will move us towards this goal, but it will not take us all the way there. By establishing a framework of general principles and institutions, and by setting up a process through which governments can meet regularly, the Convention serves as a yardstick for assessing achievements and new actions. In facing up to man-made climate change, we are going to have to think in terms of decades and centuries. The job is just beginning•

Michael Zammit Cutajar is Executive Secretary of the United Nations Framework Convention on Climate Change.

Larry Prosor/UNEP/Topham Picturepoint

M. & C. Denis-Huot/Still Pictures

The lion in the dark

R. SHAKESPEARE MAYA

argues that developing countries have become their own worst enemies by failing to take a strong enough negotiating position on climate change

The principle of 'common but differentiated responsibility' in the United Nations Framework Convention on Climate Change provides an excellent springboard for launching global efforts to mitigate climate change. Under it, developed countries acknowledge that they are responsible for the present level of environmental damage in the atmosphere and developing countries accept that – regardless of who bears the blame for the problem – all nations must act responsibly to prevent further deterioration and, perhaps, to restore the natural climate balance. It is on this basis that we have been able to come so far in setting up international mechanisms for combating further climate change.

Unfortunately, developed country Parties to the Convention have taken advantage of this understanding and the whole exercise has been reduced to negotiating tactics and strategic economic positioning. This trend – signalled and spearheaded by the United States as early as the 1992 Earth Summit – poses an even greater economic threat to developing countries than the present extent of climate change itself.

Developing countries have failed to take a hard-nosed approach. If they take a firm hand the world can find a serious response to climate change and a commitment to act meaningfully to meet the Convention's requirements. A weak developing country position, as now, represents the greatest danger both to efforts for reducing greenhouse-gas emissions and to their own internal economies.

Survival and naivety

Developing countries can only act within the bounds of two possible extremes. One is to participate fully and take equal, not differentiated, responsibility, as the United States wishes. The other is to pull out completely and press firmly for the North to take full and active responsibility. A middle position (the trend up to now) is a natural recipe for economic bickering, and leads to differentiated penalization by countries like the United States of those developing countries that fail to succumb to their position. Climate change is now about economic impacts and survival and it would be naive to expect the powerful to go easy.

Some argue that there can be no basis for action without clear and conclusive evidence of climate change, and that there is no justification for putting resources into responding to a perceived threat based on a weak scientific argument. Initial debate on climate change in such developing countries as Zimbabwe centred on this theory and was also slightly tainted with the traditional North-South conflict and a rather unrefined concept of the 'polluter pays principle'.

Yet the 'precautionary principle' has now gained acceptance both among ▶

most industrialized countries – including the United States, historically its most pronounced antagonist – and among developing countries, who have not the resources to go on a wild goose chase. If someone shouts 'LION' in the dark you would be foolish indeed to sit still and relax just because you cannot tell which direction the beast is coming from. But how far would you run for fear of the lion ill-defined in the dark? Naturally you would run until dawn, when it should become clear that the lion really exists.

Two-thirds of the Convention's 165 Parties are developing countries. It is not clear what they hope to achieve. But there are three possible benefits of membership. The first is to pressure industrialized countries, within the framework of the Convention, to act decisively and practically on their climate change obligations under it. The second is to enhance their own access to technologies that may be ushered in by global collaboration over climate change. The third is to participate in an important global initiative.

There is nothing wrong with any of these expected gains. But developing countries have not been able to position themselves well enough to achieve them. From the beginning, they failed to push the climate change debate into a strong framework of global negotiations. Such a framework, with clearly stated developing country goals, would have given them a more systematic and consistent approach to the negotiating process.

Both at the Rio Earth Summit and now, the only practical framework to fall back on has been the North-South dialogue. Developing countries managed somewhat to hang together in the form of the Group of 77 (G-77) and China. Perhaps this would be better expressed as China and G-77 – for China and, to a lesser extent, India, are, like it or not, the United States' major concerns.

The African block seems to be settling on four principal positions:

- **That a ceiling be imposed on emissions on a per capita basis.**
- **That developing countries be allowed to increase their emissions, since they have to expand their industrial base.**
- **That a time scale be agreed within which both industrialized and developing countries would reach the same emissions level.**
- **That there be agreement on a convergence and stabilization of per capita emissions as a basis for future development paths.**

These positions are weak and extremely watered down because of the lack of a clear objective or 'stated gain structure' by Africans and their colleagues in G-77 and China. This, in turn, stems from the lack of a negotiating framework.

Industrialized countries have a specific objective. Their message is clear, and this is another reason for loss of direction in global climate change effort. They wish to:

- **Maximize economic benefits from the emerging climate change technology markets.**
- **Protect their industries from any losses associated with activities to meet their emissions reduction targets under the Convention.**

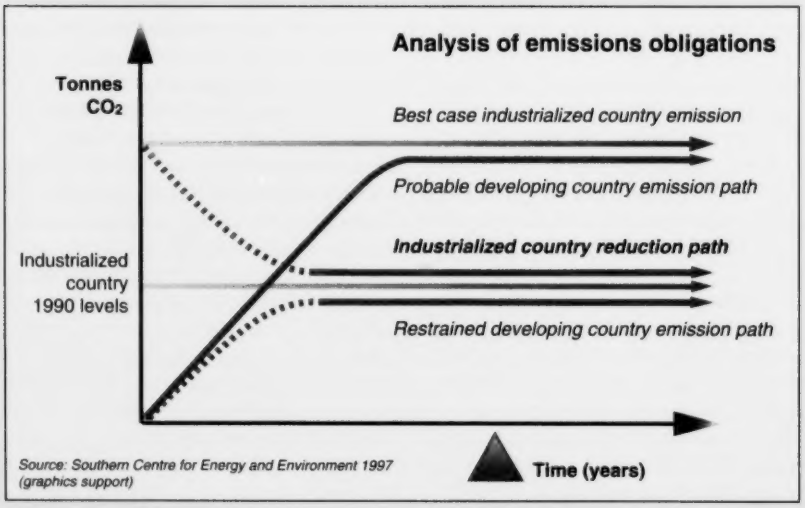
These wishes strongly correlate with the push to force developing countries to make commitments to reduce their carbon dioxide emissions. If the South does this, it will become a much stronger market for mitigation technologies, which are overwhelmingly supplied by industrialized countries.

Industrialized countries would thus ensure that the developing countries were compelled to harness a much broader range of cleaner technologies than they would under voluntary mechanisms. Under these arrangements, industrialized countries would not logically be required to facilitate developing countries' access to technology. This would lead to a major debt trap made worse by deepening technology dependency. And the costs of the learning curve in implementing mitigation activities would be more broadly spread among all countries, rather than falling on industries in developed countries alone.

Strategic failures

Developing country positions – such as those presented by Africa – fail to provide a matching response to those of industrialized countries because they are mainly tactical, and are much less strategic. The position of G-77 countries is further weakened by the apparent discord within the industrialized countries. It is hard for them to outline clear strategic positions when they seem to have allies among developed nations as well as foes.

United States industry, it is well known, has made strong inroads in Congress in its attempt to force the Government not to make major domestic commitments to reducing greenhouse gases. Denmark's strong message that it seeks a 'zero-coal' future, on the other hand, seems an encouraging development for the G-77 position. But closer analysis shows that the success of the anti-coal lobby in Denmark, or anywhere else in Europe



Source: Southern Centre for Energy and Environment 1997 (graphics support)

The South would do great harm to their own economies by failing to press hard enough for quantifiable and well-targeted reductions in the North

and America, threatens a grim future for coal-sector development in developing countries. How could Danish funds be used to finance the activities of the coal sector in developing countries if the Danes had successfully opted for a zero-coal future?

The argument for per capita emissions is being presented as a way of reducing the economic losses of developing countries, and of limiting burden-shifting from industrialized nations to them. Even after a 20 per cent reduction by 2005, United States per capita emissions would be 20 times – and those of the United Kingdom 10 times – those of India: it would be a long time before they were equalized. Tactically this is a reasonable argument both for equity and to forestall burden-shifting. The graphic (opposite page) shows possible trajectories of emissions from developed and developing country Parties.

The economic implications of the present stalemate in the negotiations are hard to determine. Long-term impacts would gradually set in as the negative effects of the physical aspects of climate change begin to influence production. Short-term impacts derive from the political aspects of climate change. The first would come from a change in the environment, the second from a change in global economic circumstance.

The best solution is for G-77 and China to press for real quantifiable reductions by industrialized countries. This would have the effect of pushing up relative prices in the North for traded goods. If accompanied by the serious application of the Convention's principles – particularly the article on technology transfer and support for climate change activities in developing country Parties – this would indeed reduce the economic gap between the North and the South and force global economic harmony on a cleaner development path. The South would do great harm to their own economies, to the environment, and to global economic relations by failing to press hard enough for quantifiable and well-targeted reductions in the North.

Ron Giling/Panos Pictures

In conclusion, two factors will determine the extent of the negative economic impacts of climate change activities on developing countries. One is the extent to which industrialized countries can carry out serious emission reduction in their own territories. The second is the position of developing countries in making commitments. Commitments to reduce their own emissions would result in fully shifting the burden from industrialized to developing countries, and create a huge captive market for cleaner production technologies in developing countries to the disproportionate benefit of industrialized ones, leading to further economic differentiation between the two blocs.

These negative effects are made possible by the lack of a clear economic benefit target by G-77 and China, who seem to dwell more on tactical positions than on a clear and publicly pronounced one. The lack of such a position is both the greatest danger to the climate and the most potent source of economic loss to developing countries•

R. Shakespeare Maya is Executive Director of the Southern Centre for Energy and Environment, Harare, Zimbabwe.

THE SOUTH IS ACTING

A. ATIQ RAHMAN describes voluntary action on greenhouse gases by developing countries, and says that the North must stop taking the planet hostage

The Kyoto Conference is the most important environmental meeting since the 1992 Rio Earth Summit. It presents both a great challenge and an enormous opportunity to take some necessary, practical and tangible steps to reduce the threat of climate change.

Global scientists and the expert community are calling for a 20 per cent cut from 1990 levels of greenhouse-gas emissions by 2010. But, in reality, levels have increased by more than 12 per cent over the five years since the United Nations Framework Convention on Climate Change was agreed in Rio.

So far the negotiations, and a practicable compromise, have been blocked by a group of industrialized countries led by the United States, where only 4 per cent of the world's population contributes 20 per cent of emissions of greenhouse gases. Meanwhile Japan, the host country of the meeting – the Third Conference of the Parties to the Convention (or COP-3) – has been accused of poor leadership and has not been able to put forward a reduction target, though along with many others it wants to ensure that all countries participate in a legally binding Kyoto Protocol. In addition, several OPEC countries, led by Saudi Arabia and Kuwait, have been accused of obstructing the process of achieving a common position for developing countries, represented by the Group of 77 and China, despite the fact that most of them are vulnerable to sea-level rise, extreme weather events, mass migration, threats to food security and other impacts of climate change.

The negotiators have a series of options before them. The Alliance of Small Island States (AOSIS) proposed a 20 per cent reduction by industrialized countries of their 1990 level of greenhouse-gas emissions by the year 2010, and this is supported by most of the scientific community, many developing countries and the global community of civil society participating in climate negotiations. The European Union is calling for a 15 per cent reduction by 2010 and a 1.5 per cent reduction by 2005, while Brazil has made a very similar proposal.

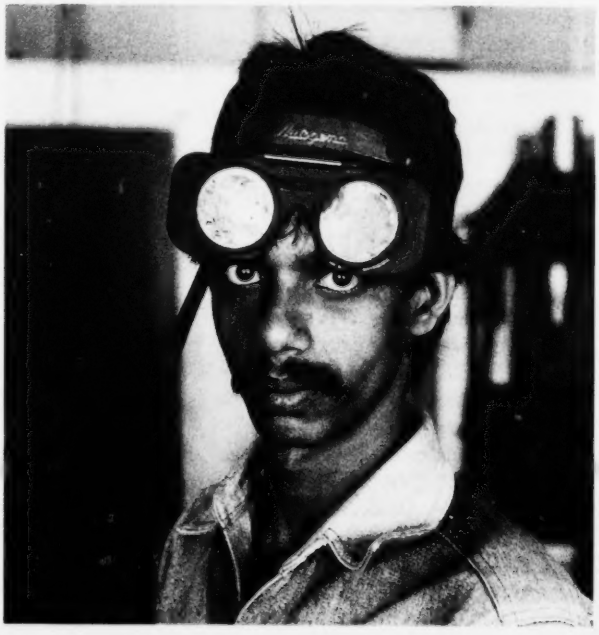
IPCC findings

The global consensus of scientists, through the *Second Assessment Report* of the Intergovernmental Panel on Climate Change (IPCC) concluded that deeper cuts would be needed to stabilize and reduce greenhouse-gas concentrations. They also pointed out that early reductions were essential because there is a time-lag before the atmosphere and the oceans respond. Over 2,400 scientists and 2,000 economists endorsed the findings of the IPCC and urged world leaders to take prompt action. And President Clinton asserted in a speech on 6 October: 'I am convinced that the science of climate change is real. Although we do not know everything, what we do know is enough to warrant responsible action.'

The debate seems to be increasingly shifting – and is sometimes manipulated – from scientific concerns and ecological imperatives to uncertainty about economics and the costs of taking action. The enormous ecological cost of inaction has often been kept out of these calculations. So has the fact that many new jobs would be created from opportunities – such as the expansion of solar energy – arising from a de-carbonized economy.

The oil and coal industries worry that their profits will be reduced if Northern countries reduce fossil fuel consumption. So, as Ellen Goodman of the *Boston Globe* wrote recently: 'The same industry that told us that climate change was bunk is now shelling out $13 million in ads to convince the public that, even if it isn't bunk, it will cost us too much to deal with.' But, she added: 'the public has learned something from its encounters with the tobacco folks. It is a bit of post-industrial skepticism about industry-financed science and corporate dis-informercials.'

One of the critical issues holding up progress in the negotiations is the perception that developing countries will together become the major contributor to greenhouse-gas emissions some time between 2020 and 2050. So, cry some of the obstructionists of the Kyoto negotiations, they must undertake some commitment to reductions. Most others demand that the industrialized countries – who committed themselves under the Convention and are mainly responsible for creating the problem – must commit themselves first. 'Most developing countries are already taking significant voluntary steps to integrate climate change and greenhouse-



Jorgen Schytte/Still Pictures

Mark Edwards/Still Pictures

gas reduction,' said the leader of one key developing country delegation recently. 'Calling for developing countries to undertake such commitments at this point is a diversionary tactic, and a violation of the Convention.'

In fact, most developing countries are already demonstrating a serious commitment by taking voluntary action. As a World Resources Institute report by Walter Reid and Jose Goldemberg puts it : 'Developing Countries are already effective participants in global efforts to reduce greenhouse-gas emissions. Indeed, since the signing of the 1992 Framework Convention on Climate Change, developing countries may have achieved greater carbon dioxide (CO_2) emission savings than industrialized countries.'

China – which accounts for 12 per cent of total world energy-related CO_2 emissions, second only to the United States – has, says the report, achieved 'the most significant carbon savings over the past decade'. It explains: 'Although annual carbon emissions grew by 228 MtC [million tonnes carbon] between 1980 and 1990, emissions would have been 155 MtC higher in 1990 without energy efficiency gains achieved over this period. The World Bank estimated in 1996 that further efficiency gains in China have the potential of yielding savings of 1,000 to 1,700 million tonnes of coal equivalents per year by 2020 – an amount greater than China's total energy consumption in 1990.'

It adds: 'Within the past six years, India, Mexico, South Africa, Saudi Arabia and Brazil – all of which rank among the top 25 countries for industrial CO_2 emissions – also cut fossil fuel subsidies significantly.'

And it points out: 'Much of the growth in emissions in developing countries results from the provision of basic human needs for their growing populations, while that in ▶

industrialized countries contributes to growth in a standard of living that is already far above that of the average person worldwide.'

Developing countries are taking responsible action both in the letter and the spirit of the Convention...

In a major initiative, a consortium of environment-development research organizations involved in global climate change has started a series of Regional Workshops in Africa, Latin America and Asia involving representatives from governments, the private sector, non-governmental organizations (NGOs) and the research community from both North and South. The organizations include the Bangladesh Centre for Advanced Studies; the Pacific Institute for Studies in Development, Environment and Security; the Woods Hole Research Centre; Environment and Development Africa; and COPPE, The Graduate School of Engineering at the Federal University of Rio de Janeiro, Brazil. Their efforts are supported by over 10 other collaborating institutes from North and South and have financial support from four Northern countries and the European Union. Their final workshop is in Kyoto during the Conference.

The initiative has produced a report, based on over 12 country studies, which demonstrates a large number of good practices that support development and yet make significant contributions to greenhouse-gas reduction. Peoples and communities in most developing countries are taking many steps – including energy efficiency, improved cooking stoves, better and low carbon housing, afforestation, switching fuels and cogeneration – making a significant contribution both to local environmental benefits and to the reduction of global carbon emissions.

Bangladesh, one of the countries most vulnerable to global climate impacts – including sea-level rise, related flooding and enhanced drought – has mobilized both government and non-government agencies in a nationwide tree planting and reafforestation campaign. Early calculations have shown that, as a result, Bangladesh became a net 'absorber', rather than an emitter, of CO_2 in 1995 and 1996.

India has initiated a massive programme on wind energy, and its current Five Year Plan (1992-1997) includes a National Energy Efficiency Programme, which has the potential to save 5,000 megawatts (MW) in the electricity sector and 6 million tonnes of oil in the petroleum sector.

Brazil uses ethanol from sugarcane for a transport fuel, and its PROCED programme will avoid the installation of 1,600 MW of new electricity generation at a quarter of the cost of generating the additional power.

Cooperation opportunities

The studies, and the regional workshops, also demonstrate opportunities and potential for technology cooperation. Most developing countries are building a capacity to address the issue at governmental, academic and NGO and community levels. There is significant interest from the private sector, which is waiting for the appropriate profit signals.

Most developing countries are attempting to achieve sustainable development and, in the process, reduce greenhouse-gas emissions, thus fulfilling the two clear objectives of the Convention. Socio-economic realities may not allow them to make greenhouse-gas reductions a prime force for development, but they are consciously contributing to such reductions all the same.

It is futile, therefore, for obstructionists to take the planet hostage – and fail to act in the best interests of all people and future generations – on the false premise that developing countries are not acting responsibly. For they are, in fact, taking responsible action both in the letter and the spirit of the Convention. There is a strong case that they should work even harder at this – but the Convention clearly allows for the provision of 'new and additional funding' to that end. All industrializing and developing countries must act to save the planet from the threat of climatic destabilization – but industrialized countries must first make the commitment to significant reductions themselves. They must not cop out from commitment at COP-3 •

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Dr. A. Atiq Rahman is Director of the Bangladesh Centre for Advanced Studies, Dhaka, and Coordinator of the Climate Action Network, South Asia.

Carbon for sale!

CHRISTIANA FIGUERES and **ANNE HAMBLETON**
describe a win-win strategy for reducing greenhouse-gas emissions in developing countries

The science of climate change has finally reached a reasonable degree of consensus – but the same is not true of its political and economic aspects. The world is at the height of a heated debate over the basic questions of who will reduce greenhouse-gas emissions, by how much, and by when.

Under the Berlin Mandate, stemming from the First Conference of the Parties to the United Nations Framework Convention on Climate Change in 1995, industrialized (or 'Annex 1') countries have committed themselves to 'setting quantified limitation and reduction objectives within specific time frames for anthropogenic emissions by sources and removals by sinks of greenhouse gases not covered by the Montreal Protocol'. These objectives – and policies and measures for reaching them – are to be adopted in Kyoto. The Mandate also states that the Parties would 'not introduce any new commitments' at this time for other non-Annex I countries.

In the short run, legally binding commitments for reductions by developing countries are not politically viable. It is unreasonable to expect countries whose per capita emissions are a fraction of those of the major emitters to adhere to the same standards, particularly when they have a lower standard of living. In the long term, however, the alarming rise in human population and rapid economic expansion in developing countries dictate that, in the future, their emissions will overtake those of the presently industrialized. So they will need to make emission reductions if ecological disaster is to be avoided.

Binding reductions, typically implemented through the use of national emissions caps, cannot be discussed until the industrialized countries show reasonable compliance with targeted reductions within agreed timetables. But there is a great opportunity immediately to engage developing countries in *voluntary* efforts to cut the release of greenhouse gases: indeed, they are already participating in them. A study by Jose Goldemberg and Walter Reid recently published by the World Resources Institute (WRI) concludes that: 'Since OECD countries overall will fail to meet voluntary targets for returning emissions to 1990 levels... developing countries may be achieving equivalent or greater CO_2 emission savings than OECD countries in absolute terms and, since they are starting from a lower baseline, significantly greater savings as a percentage of their emissions.'

Economic incentives

The WRI study shows that current emission savings in developing countries stem not from climate change concerns, but from basic economic incentives. And therein lies the lesson. As long as it is economically advantageous to do so, developing countries will continue to increase emission savings regardless of whether a legally binding cap is imposed upon them or not. Economic incentives for reductions include cost savings from new efficient technology and payment for the environmental service of saving emissions of greenhouse gases.

This environmental service – the 'decarbonization' of the atmosphere – can be attained either by reducing or avoiding carbon dioxide (CO_2) emissions, as through increased energy efficiency or renewable energy generation, or by sequestering carbon, as through improved land uses. While a similar case can be made for methane, for the purpose of the argument we have focused on CO_2.

It is important to understand the difference between the primary products of decarbonization activities, such as electricity and wood, and the secondary product – carbon. Decarbonization projects are comprised of two parallel flows, and the differences between them are just as critical as their interaction. The first flow is typical of any traditional investment in an electricity generation or forestry project. The project goes through the stages of prefeasibility, feasibility, development and, if found viable, financing and construction (for power generation) or planting (for forestry). The products are electricity or wood. This 'traditional flow' must have a manageable level of risk and an acceptable internal rate of return, as the project is typically financed by multilateral or private commercial banks ▶

Reuk Rutter/UNEP/Topham Picturepoint

or specialized funds (or a combination of them), and undertaken by an investor aiming to recover costs or make a profit.

The second flow is the 'carbon flow'. Here, the project goes through the stages of measuring the incremental mitigation of greenhouse-gas emissions additional to those that might have arisen in the absence of the project, as well as certification, monitoring and verification. The products of this flow are the avoidance or reduction of CO_2 emissions (for energy projects), or fixed carbon (for land-use projects) – 1 tonne of carbon is equivalent to 3.67 tonnes of CO_2, both of which are hereafter referred to as 'carbon'. These products can be purchased by greenhouse-gas emitting sources, such as thermal power generation companies, to offset their own emissions.

Selling rights

The market price of carbon must cover the direct costs of reducing it (as in all the above stages of the carbon flow), the transaction costs, and its opportunity cost. Ultimately, what are being sold are future emission rights. This can positively affect the internal rate of return (IRR) of the entire project. Where projects have a healthy IRR on the traditional flow, selling the carbon provides an incentive to implement more greenhouse-gas efficient ones. Where they are not quite commercial – in the specific case of a conservation project, for example, the carbon flow is the only flow of the project unless commercial activities such as bio-prospecting or ecotourism are incorporated – the carbon sale could make them viable. In both cases, demand for projects with decarbonization components will increase.

Once a project is segregated into these traditional and carbon flows, it is easy to see the differences between the two. Whereas, for example, electricity and timber have reasonably established markets, the market for carbon is only just being created: some transactions have occurred but the market has been thin and the forces of supply have been greater than those of demand. This has caused erratic variances in both the price and the quality of the carbon. There is, as yet, no regulatory framework, and in the absence of legally binding reduction commitments by industrialized countries, there is no substantial demand for carbon and hence no clear incentive to invest.

Paying for the decarbonization service gives developing countries an economic reason to participate immediately in activities to mitigate climate change

The risks incurred by each flow are also different. Within the traditional flow, an investor or debt provider weighs and assumes the risks of financing, technology, delays in operation and such country-specific risks as political or regulatory changes. Within the carbon flow, the investor must weigh all of these typical risks – and the probability of emission caps and the emergence of a fully fledged carbon market, insurance mechanisms, certification and verification.

The interrelation between the two flows is equally important. A project planned exclusively on the traditional flow will seek to maximize the output of energy or wood, without any regard for greenhouse-gas emissions. The same project, if planned on the mutual reinforcement of both flows, may incorporate changes in design and implementation changes which increase greenhouse-gas mitigation in order to maximize the return on the combined output.

Covering costs

It is critically important that the carbon flow must be monetarized separately from the traditional flow as a distinct product: it can never be diluted into the overall project as a 'gift'. Carbon reduction has intrinsic costs, and these must be covered. There is no free carbon! Carbon, sold as a commodity, is the only incentive currently available for encouraging developing countries to mitigate emissions further than they might achieve from unrelated economic measures. Without paying for decarbonization, the supply of this service will be less than optimal, and the global cost of climate change mitigation will be unnecessarily increased to irresponsible proportions.

This scenario is not simple. There are baseline, leakage, certification and accounting challenges to be met. Several proposals have been made on how to approach worldwide carbon transactions, including the World Bank Global Carbon Initiative, the Brazilian Clean Development Fund, and the Costa Rican Certified Tradeable Offsets. These proposals are quite distinct, but they are based on three common principles:

- **They emphasize the important role of developing country participation in greenhouse-gas mitigation activities.**
- **They treat carbon as a commodity resulting from payment for the decarbonization service.**
- **Most importantly, they depend on the industrialized countries assuming legally binding reduction commitments in order to launch the carbon market.**

Many countries in the developing world are reaching a critical juncture in their economic development. Decisions are being made about generating energy that will affect worldwide greenhouse-gas emissions for many years to come. Developing countries will eventually agree to some form of legally binding emission caps, probably based on differentiated growth baselines. In the meantime, however, they can only choose a low-emission path of development if there is a clear economic reason to do so.

Paying for the decarbonization service gives developing countries an economic reason to participate voluntarily and immediately in activities to mitigate climate change, and opens the way for them to choose a cleaner development path. The innate elegance of this mechanism is that it represents a substantial cost saving for industrialized countries at the same time. The world cannot afford to miss this win-win opportunity •

Christiana Figueres is Executive Director and Anne Hambleton is Program Director at the Center for Sustainable Development in the Americas.

NASA/Still Pictures

MICHAEL H. GLANTZ examines the El Niño phenomenon and discusses suggestions that recent events may be related to global warming

El Niño events disrupt human activities around the globe more than any other climate-related process apart from the natural flow of the seasons. Every four and a half years, on average, anomalously warm water appears along the equator in the eastern and central Pacific Ocean and tends to cause unexpected – and undesirable – shifts in weather systems both in tropical regions and, to a lesser extent, in North America and elsewhere in the mid-latitudes.

The name El Niño (EN) was originally used to describe a seasonal warming of sea surface waters off the western coast of South America, centred on Peru. But meanwhile the Southern Oscillation (SO) takes place in the atmosphere on the other side of the Pacific. This atmospheric phenomenon is a seesaw-like change in sea-level pressure across the Pacific basin: when the pressure is low in the region round Darwin, Australia, it is usually high in the region of Tahiti. These two processes (EN+SO) together produce ENSO, a Pacific basinwide phenomenon that disrupts weather around the globe. Although El Niño referred originally to a local phenomenon and ENSO to the basinwide event, many people, including scientists, now use these terms interchangeably.

These events can be weak, moderate, strong or – rarely – extraordinary. A weak event covers the eastern portion of the equatorial Pacific and has sea surface temperatures 1 or 2°C above average. A strong one covers a large part of the equatorial Pacific and sea surface temperatures increase by 3 or 4°C or more.

Normally, warm ocean water builds up in the western part of the equatorial Pacific Ocean near Australia, the Philippines and Indonesia. This build-up results from strong westward flowing winds blowing across the Ocean from the Peruvian coast. Every so often these winds weaken – and sometimes reverse and blow towards the east – which allows a warm pool of water to form in the central and eastern part of the Ocean.

As sea surface temperatures rise, evaporation from the warm water increases, leading to cloud formation and, ultimately, rainfall. The rain follows the warm water. So areas that are normally wet – such as Indonesia, the Philippines and northeast Australia – become plagued with drought, while areas that are normally dry – such as the west coasts of Peru and Chile and the Galapagos Islands – become excessively wet. The resulting shifts in high and low pressure systems around the globe can frequently bring drought to southern Africa, Ethiopia, India, northeast Brazil, southern Peru and Bolivia, and Central America.

During an El Niño, there are usually warm dry winters in the Pacific northwest of North America, from Oregon to British Columbia, and in the Canadian Prairie provinces. Meanwhile the northeast of the continent has mild wet winters, and the states that border the Gulf of Mexico from Texas to Florida usually get wet and cool ones. There is also an apparent sharp reduction in the number of hurricanes that form in the tropical Atlantic.

The last extraordinary event took place in 1982-1983, covering much of the tropical Pacific with relatively high sea surface temperatures. Its impacts around the globe were so devastating that popular magazines like *Reader's Digest* and *National Geographic* felt compelled to publish stories about it for the first time.

This, the biggest El Niño in a century, took the entire research community by surprise, at a time when it felt it had come to understand the process. It was bigger than expected, ▶

Mark Edwards/Still Pictures

its impacts were broader than expected and it started at an unexpected time of the year. Its impacts on climate around the globe drew the attention of researchers and policy makers to the fact that forecasting El Niño events several months in advance could provide government planners and individuals with advanced warning of possible climate-related anomalies.

Research on El Niño was elevated to higher levels: governments provided more funding and more researchers took an interest. The controversial El Niño event(s) of the early 1990s captured the passive interest of potential users of the forecasts. The most recent event (starting in 1997) has been compared to the devastating one of 1982-1983, and so has prompted decision makers in many sectors of society to try to identify ways to use such climate-related information in their management activities. In many parts of the world, it seems, El Niño information has come of age.

Originally El Niño was mainly of interest to local farmers and fishermen in Peru. During events the numbers of anchovies fell heavily. Millions of fish-eating birds used to die, their carcasses washing up along the shore, and the amount of the birds' guano, an excellent fertilizer, would be sharply reduced. Interest broadened in the early 1970s, after the Peruvian anchovy fishing industry, then the world's biggest fishery in terms of the weight of landings, collapsed, partly through El Niño and partly through overfishing, with disruptive impacts on international trade.

Information about El Niño should be viewed as a valuable commodity

Today, El Niño is under great scientific scrutiny. It is monitored daily by satellites, as well as by moored buoys and 'ships of opportunity' that happen to be crossing the Pacific. Weather satellites keep constant vigil, monitoring sea-level changes, ocean surface temperatures, cloud formation, etc. The Internet has scores of web sites devoted to the phenomenon.

Improved monitoring

Considerable effort has been devoted during the past 15 years to improving understanding of the science of El Niño so as to be able to forecast its onset several months to a year in advance. An international global research programme from 1985 to 1994 – Tropical Ocean and Global Atmosphere – greatly improved monitoring capabilities. There have even been a few forecasting successes – for example, of the 1986-1987 and 1991-1992 events. Unfortunately, there have also been recent forecasting failures, such as the unexpected return of El Niño in 1993.

A considerable body of usable information about El Niño already exists for several parts of the globe and it could enable decision makers in agriculture, fisheries, energy production and public safety to make somewhat better informed decisions. Unfortunately many are not yet aware of the potential value of using historical El Niño information in their decision processes.

Not every region of the globe can identify a direct influence on its local and regional weather and climate, but that should not deter the search for an improved understanding of El Niño. The influence of El Niño in East Africa may remain unclear, but Kenya's coffee trade is affected by what happens to the crops of competitors like Colombia, Brazil and Indonesia, which are directly impacted by the phenomenon. The same logic applies to other commodities traded in the world marketplace, such as cocoa, sugar, palm-oil and fishmeal. Information about El Niño and its impacts on distant regions should be viewed as a valuable commodity. Forewarned is forearmed.

Expecting the unexpected

Scientists and the public alike have been surprised by just about every El Niño event. Researchers have been studying El Niño as a basinwide phenomenon only since the mid-1970s and so we have not as yet witnessed all the ways it can form and manifest itself. Have we yet seen the biggest event, or witnessed all possible combinations of impacts that might occur during an El Niño? Just when scientists feel they understand it well enough to produce reliable forecasts many months in advance of its onset, it takes a different form. So we must expect El Niño-related surprises to continue for a long time yet.

Most recently, two researchers at the National Center for Atmospheric Research in Boulder, Colorado – Kevin Trenberth and Timothy Hoar – have suggested that El Niño's 'strange' recent behaviour between 1991 and 1995 results from the influence of global warming on the Pacific. They concluded: 'Both the recent trend for more ENSO events since 1976 and the prolonged 1990-1995 ENSO event are unexpected given the previous record, with a probability of occurrence about once in 2,000 years. This opens up the possibility that the ENSO changes may be partly caused by the observed increase in greenhouse gases.' However, other researchers have challenged their conclusions and the issue remains fertile ground for scientific debate and enquiry.

In November 1991, in an attempt to separate speculation from science, UNEP's World Climate Impact Assessment and Response Strategies Programme sponsored what was perhaps the first workshop to focus on the El Niño/climate change issue.

Participants representing various perspectives noted that El Niño would probably continue to occur with global warming and that computer models suggest that events could become more intense. They also said that present knowledge suggests that the frequency of El Niño events is less likely to change: there are likely to be long and short El Niño events in the future, as in the past.

Australia's Bureau of Meteorology Research Centre held a similar workshop in 1993 addressing similar issues and participants came up with similar responses. But it is important to note that these answers are speculative at present. More research is needed not just on El Niño and its impacts but on global warming's potential influence on it•

Dr. Michael H. Glantz is a Senior Scientist in the Environmental and Societal Impact Group, National Center for Atmospheric Research, Colorado. He is the author of Currents of Change: El Niño's Impact on Climate and Society, *published by Cambridge University Press in 1996.*

NEWS

SEYCHELLES HOSTS REGIONAL SEAS PROGRAMME

Elizabeth Dowdeswell, UNEP's Executive Director, paid an official visit to the Seychelles to preside over the inauguration of the Regional Coordinating Unit (RCU) of the Eastern African Regional Seas Programme on St. Anne Island.

The RCU is the culmination of efforts by nations in the East Africa region to find a way to manage their common heritage in a sustainable manner. It provides a framework for cooperation on issues related to the sustainable use and management of marine and coastal resources. In addition to regional projects, the RCU also aims to promote international initiatives for the protection of coral reefs and the protection of the marine environment from land-originating pollution, among others.

The establishment of the RCU in the Seychelles is the result of the coming into force last year of the Nairobi Convention of the Eastern African Regional Seas Programme which has adopted an integrated, results-oriented approach to combating problems of the marine environment of the East African Coast •

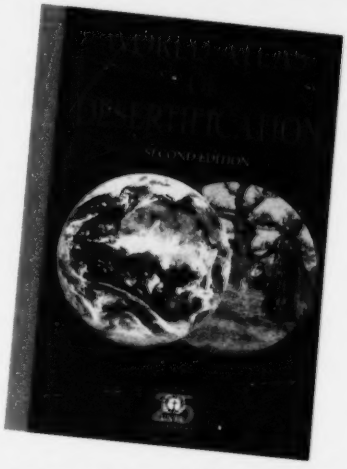
MAINSTREAMING THE GENDER PERSPECTIVE

A special session of the coordination segment of the Economic and Social Council on Maintaining a Gender Perspective in all policies and programmes of the United Nations system took place in Geneva in July.

UNEP's Executive Director, in her address to the session, highlighted the need to foster and encourage the ability of women to contribute to effective environmental management, and delineated the progress UNEP had made in strategically addressing issues related to gender and equity announced at the Fourth World Conference on Women in Beijing in 1995. UNEP's strategy is based on 10 specific commitments to meet the global priorities for the advancement of women by the year 2000. Foremost among those commitments are: the need to incorporate women's concerns into UNEP's policies, programmes and projects; adjusting recruitment policies to recognize the special constraints that women face and to create a favourable environment for their recruitment; assessing managers' willingness to meet gender criteria in performance appraisals; ensuring participation by women and also ensuring that gender concerns are reflected in policy development work •

Mark Edwards/Still Pictures

NEW DESERTIFICATION ATLAS



A new edition of UNEP's World* Atlas of Desertification, *published in September 1997, is now available (£145) through: SMI (Distribution Services) Limited, P.O. Box 119, Stevenage, Hertfordshire SG1 4TP, UK. Fax: +44 1438 748884.

This second edition is thoroughly revised and twice the size of its 1992 predecessor. It reflects major advances in our understanding of desertification and clearly demonstrates that desertification is accelerating to become one of the world's most pressing environmental problems. This edition covers poverty and food security, climate change and the availability of water, and contains the latest information on population movements which result from, and lead to, desertification. Representing in graphic form the current state of our understanding of the issue, as well as its extent and possible solutions, the Atlas includes a wide range of case studies and will become the key reference book for all concerned with dryland problems •

NEWS

STRENGTHENED LINKS ON SPORT AND THE ENVIRONMENT

The International Olympic Committee (IOC) regional seminar on Sport and Environment was held in July in Christ Church, Barbados. The seminar focused its discussions on strengthening partnerships between institutions to promote environmental protection during sports events. The participants, staff members of the National Olympic Committees of the Caribbean region, representatives of non-governmental organizations and representatives of international organizations dealing with environmental protection activities reaffirmed the need for working jointly with the IOC National Olympic Committees and UNEP. The meeting also recommended that a special edition of *Tierramérica* (UNEP's regional newspaper supplement dedicated to environmental issues) on sport and the environment be published with the participation of relevant sports winners in the region•

TRAFFIC POLLUTION ADDRESSED IN KENYA

The Forum on Environment in Kenya in July, hosted by UNEP's Regional Office for Africa, took note of the report of the Working Group on implementation and enforcement of the Traffic Act (Vehicular Pollution) and recommended that the Sub-Groups should meet to discuss further the recommendations of the Working Group. These included: a review of the Traffic Act; revitalization of vehicle inspection centres and acquiring necessary equipment for measuring invisible emissions; and enhancement of public awareness on vehicular pollution. The next item on the agenda for the Forum will be Waste Disposal Management•

Beth Press/Panos Pictures

LATEST RATIFICATIONS TO ENVIRONMENTAL CONVENTIONS

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

COUNTRY	RATIFICATION (R)/ACCESSION (A)	ENTRY INTO FORCE
Cambodia	4 July 1997 (R)	2 October 1997
Antigua and Barbuda	8 July 1997 (A)	6 October 1997
Uzbekistan	10 July 1997 (A)	8 October 1997

thus becoming respectively the 140th, 141st and 142nd Parties to CITES

LONDON AMENDMENT TO THE MONTREAL PROTOCOL
Islamic Republic of Iran Total number of ratifications: 116 Parties

COPENHAGEN AMENDMENT TO THE MONTREAL PROTOCOL
Belgium, Colombia, Islamic Republic of Iran Total number of ratifications: 72 Parties

PROGRESS ON EARTH OBSERVATION

The Government of Norway confirmed its intention to jointly fund with UNEP a UNEPnet/Mercure Implementation Centre in Arendal, Norway. The Norwegian Mercure station is one of a series of satellite earth stations around the globe which will facilitate a dedicated environmental information network.

- **The Nairobi Mercure station is now fully installed and capable of operating.**
- **The German Space Agency (DLR) provided staff and expertise to install the CILS information locator system in Nairobi during August. UNEP has been collaborating with the Committee on Earth Observation Satellites to bring about the completion of this task.**
- **The Mercure configuration for full Internet service is being tested and proceeding under extra-budgetary funding from the Mercure Board•**

JOURNALIST WINS SASAKAWA PRIZE

The Sasakawa prize for 1997 has been awarded to Barbara Pyle, Environment Editor of CNN, the United States news television channel, for her efforts over more than 20 years to make environmental issues understandable and accessible to the widest possible audience. Barbara Pyle is also Vice President of Environmental Policy of Turner Broadcasting System. As a writer, and as producer and director of numerous television programmes, she has taken the debate about sustainable development to the public at large. She was the originator, for example, of CNN's daily environmental news feature, *Earth Matters*.

Barbara Pyle's films have won more than 75 awards and her work has been seen by approximately 2 billion people worldwide. She has also created environmental programmes for children, including a cartoon adventure series called *Captain Planet and the Planeteers•*

AVERTING CATASTROPHE

HIROSHI OHKI

Global warming poses one of the most serious threats to humankind. Nearly all of the world's most respected scientists have called on governments around the world to take serious preventative action. Though we do not know exactly how climate change will manifest itself, we do know that it is occurring and that it is likely to bring catastrophic results. Our civilization must learn to curb our emissions of greenhouse gases or a climate crisis will force radical and perhaps impossible choices upon us within 50 to 100 years – or rather upon our grandchildren and great-grandchildren. This is a legacy we should avoid.

Minister of State Hiroshi Ohki
Director General of the
Environment Agency, Japan

Now our governments are preparing to meet and negotiate an agreement in Kyoto. According to the United Nations Framework Convention on Climate Change, the final objective of the treaty is the 'stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.' Very few countries actually disagree with these goals.

Finding common ground

This does not mean, however, that making an agreement in Kyoto and implementing consequent actions will be an easy task. Quite the contrary. Developed countries are afraid that such actions will disturb their current economic prosperity and developing countries are expressing little enthusiasm for an agreement that could impede their economic growth. Finding a common ground is extremely difficult under these circumstances.

Prime Minister Ryutaro Hashimoto of Japan spoke at the special session of the United Nations General Assembly for review of the implementation of Agenda 21, last June, saying that 'at a minimum, atmospheric concentrations of CO_2 must be lowered by the year 2100 to levels roughly double those prior to the industrial revolution'. To do this, average per capita CO_2 emissions must be kept at less than 1 tonne: statistics show that per capita omissions in developed countries are currently at the level of approximately 3.6 tonnes. Achieving economic growth at the same time as a reduction of emissions is a difficult task requiring the concrete action of nations. We will require a series of new social and technological breakthroughs.

Japan has been implementing programmes that raise citizen awareness of global warming and help families find ways to save energy in daily life. At the corporate level, I am confident that safer and more efficient ways of producing and using energy will be developed. To encourage changes at the individual and corporate levels, governments will have to consider a whole array of policies and new financial incentives. Environmentally friendly energy options have to be available for developing countries if the CO_2 savings of developed countries are not to be exhausted by the expanding energy consumption of developing economies. It is for this reason that Japan advocated a new Green Initiative at the special session of the United Nations. Under this programme, Green Technology and Green Aid will be extended to the countries that need them most.

Reduction targets

Before we can go further, we must reach a meaningful, realistic and equitable agreement at the Kyoto Conference. The agenda is clear. We must agree on quantified reduction targets. In addition, we must consider policy measures that can be employed in achieving these reduction targets. We must also address the future participation of developing countries in our common effort to reduce greenhouse-gas emissions.

I welcome you all to Kyoto, the centre of Japanese history and culture. Moved by the seriousness of the problem before us, we can make this Kyoto Conference the site of our first historical step in reducing greenhouse gases and stopping global warming.

On behalf of my country, I pledge to give all my energy to this effort so that we may reach our goals. Let us shape an agreement which bequeaths a beautiful and bountiful planet to our children and all generations to follow•